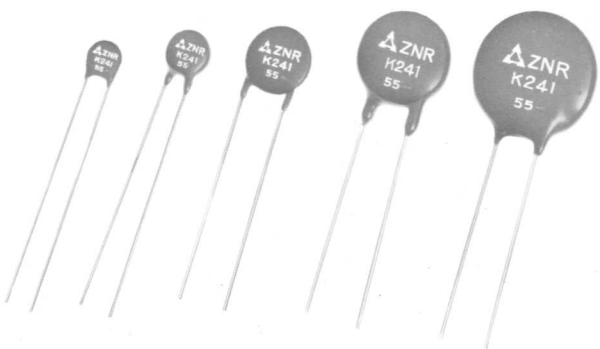
National

RZ–CA01-1

ZNR®

Transient/Surge Absorber

Type D



Applications

- *Protection of semiconductors such as transistors, diodes, ICs, thyristors, triacs, etc.*
- *Protection of various electronic equipment including:*
  Broadcasting, communications equipment
  Traffic and railway signal systems
  Automatic control devices for power ditribution
  Waterworks
  Home entertainment equipment
- *Surge absorption of relays and electromagnetic valves.*
- *Absorption of surges generated within equipment such as TVs.*

Matsushita Electric

"ZNR®" TRANSIENT/SURGE ABSORBER Type D

Matsushita ZNRs are zinc oxide nonlinear resistors whose resistance changes as a function of the applied voltage. The ZNR has a bilateral and symmetrical V-I characteristic curve and can therefore be used in circuits in place of back-to-back zener diodes. This gives your circuit clamping protection in either direction. The ZNR thus provides a highly reliable and economical way to protect against repeated high voltage transients and surges such as those produced by lightning, switching surges and noise spikes.

The ZNR utilizes a ceramic element composed of zinc oxide and several kinds of metal oxide additives that have been sintered at relatively high temperatures. Ohmic electrodes are connected to each end of the element by firing. The specific characteristics of each ZNR are determined by the properties of the ceramics used.

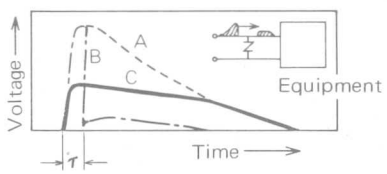
Overseas Patents

Registered: 103 patents in U.S.A. (such as No. 349,512), Canada, F.R.Germany, U.K., France, the Netherlands, Sweden, Ireland and others

Pending: 95 patents all over the world.

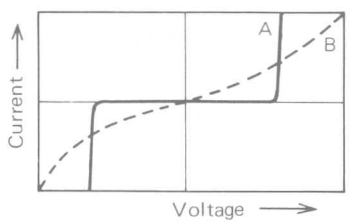
Features

- Excellent clamping voltage characteristic and fast response time (<50nsec.) when subjected to impulse surges. Eliminates the discharge lag that is indurative of gap-type arrestors.



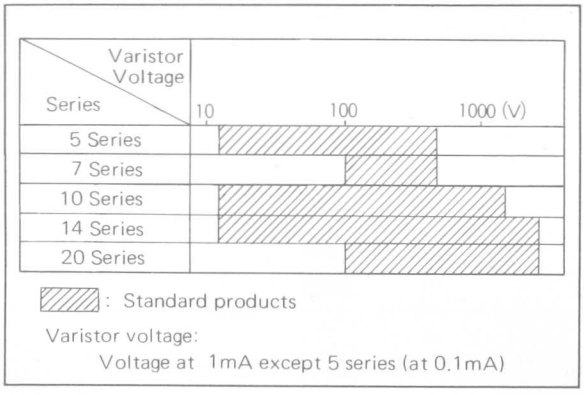
A: Original surge wave form
B: Clamping voltage using gap type arrestor
C: Clamping voltage using ZNR
τ: Discharge lag

- Bilateral and symmetrical V-I characteristic curve. The ZNR can, therefore, be used both in AC and DC circuits, for protection of either positive or negative transients.



A: ZNR
B: SiC varistor

- Broad varistor voltage from 22 to 1800V.



Varistor voltage:
Voltage at 1mA except 5 series (at 0.1mA)

Reference Guide to Standard Products

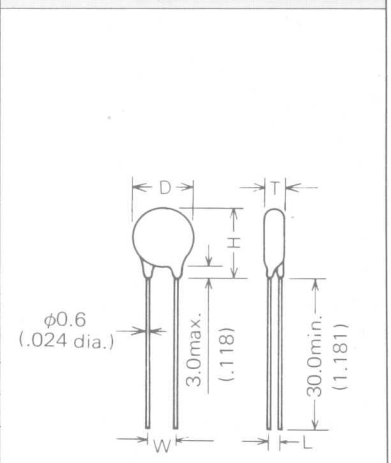
Maximum Allowable Voltage		Varistor Voltage (V)	Measuring Current of Clamping Voltage (A)	Withstanding Surge Current (8 x 20μsec.)(A)	"ZNR" Transient/Surge Absorber				
AC (V)	DC (V)				5 Series	7 Series	10 Series	14 Series	20 Series
14	18	22			○		○	○	
17	22	27			○		○	○	
20	26	33			○		○	○	
25	31	39			○		○	○	
30	38	47			○		○	○	
35	45	56			○		○	○	
40	56	68			○		○	○	
50	65	82			○		○	○	
60	85	100			○	○	○	○	○
75	100	120			○	○	○	○	○
95	125	150			○	○	○	○	○
130	170	200			○	◉	◉	◉	○
140	180	220			○	◉	◉	◉	○
150	200	240			○	◉	◉	◉	○
175	225	270			○	○	○	○	○
230	300	360			○	○	○	○	○
250	320	390			○	○	○	○	○
275	350	430			○	○	○	○	○
300	385	470			○	○	○	○	○
385	505	620					○	○	○
420	560	680					○	○	○
460	615	750					○	○	○
485	640	780					○	○	○
510	670	820					○	○	○
550	745	910					○	○	○
625	825	1000					○	○	○
650	895	1100					○	○	○
1000	1465	1800						○	○
			1		○				
			5		○		*○		
			10			○		*○	
			25				○		
			50					○	
			100						○
				50	○				
				100	○				
				250		○	*○		
				500			○	*○	
				1000				○	
				2000					○

Note: 1. ○: Standard products
2. *: Applicable for varistor voltage from 22 to 68V. (Continued to the next page)

3. Operating temperature range: −40 to 85°C (−40 to 185°F)
4. Storage temperature range: −40 to +125°C (−40 to +257°F)
   [ERZ-C05DK220 to ERZ-C05DK820: −40 to +85°C (−40 to 185°F)]
5. Maximum clamping voltage as a function of surge current is obtainable from the respective V-I characteristic curves.
6. Maximum leakage current: Refer to the V-I curves.
7. ◎: UL approved.

5 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm (in.)
ERZ-C 05DK220	7.5 (.295)	3.5(.138)	5.0 (.197)	10.0 (.394)	1.5(.059)	
ERZ-C 05DK270						
ERZ-C 05DK330						
ERZ-C 05DK390						
ERZ-C 05DK470						
ERZ-C 05DK560						
ERZ-C 05DK680						
ERZ-C 05DK820						
ERZ-C 05DK101	7.0 (.276)	3.7(.146)	5.0 (.197)	10.0 (.394)	1.6(.063)	
ERZ-C 05DK121		3.8(.150)			1.8(.071)	
ERZ-C 05DK151		4.0(.157)			2.0(.079)	
ERZ-C 05DK201		4.2(.165)			2.0(.079)	
ERZ-C 05DK221		4.3(.169)			2.1(.083)	
ERZ-C 05DK241		4.4(.173)			2.2(.087)	
ERZ-C 05DK271		4.6(.181)			2.4 (.094)	
ERZ-C 05DK361		5.2(.205)			3.0(.118)	
ERZ-C 05DK391		5.4(.215)			3.2(.126)	
ERZ-C 05DK431		5.7(.224)			3.5(.138)	
ERZ-C 05DK471		6.0(.236)			3.8(.150)	

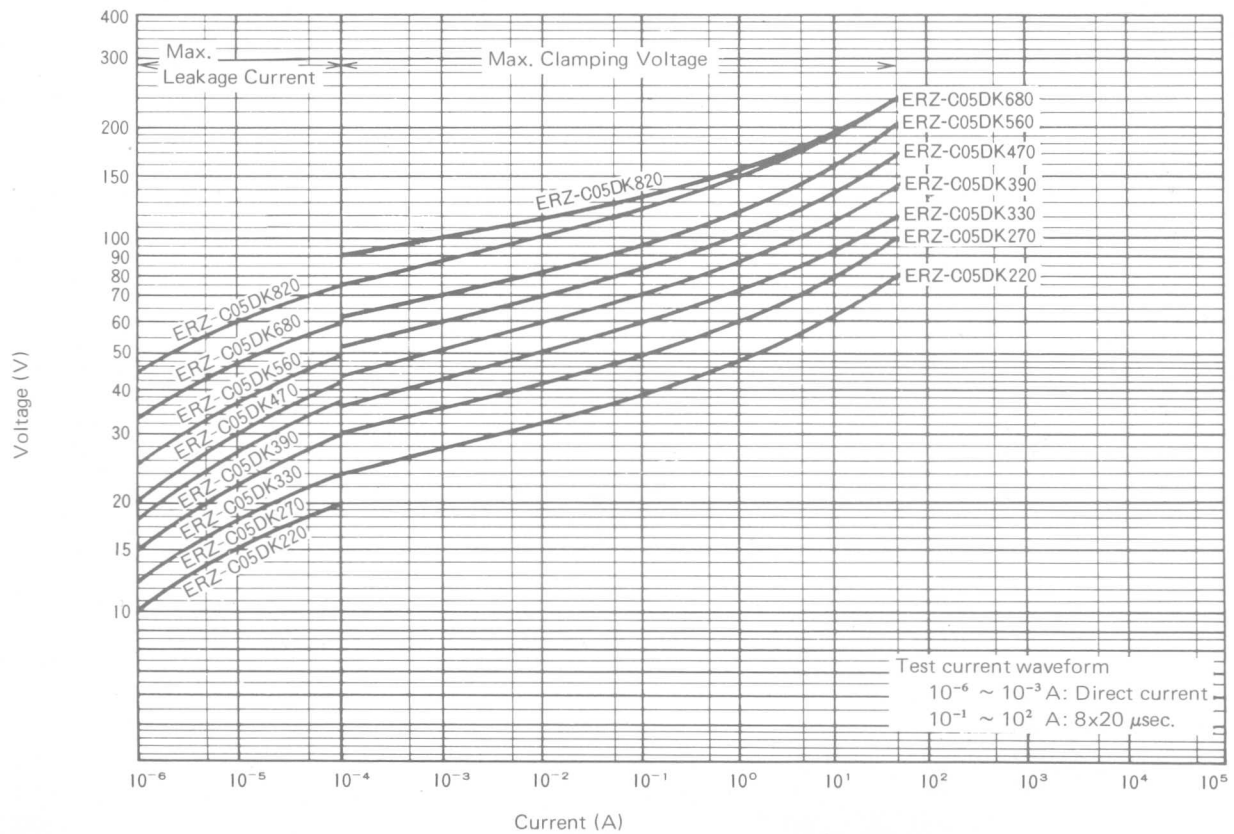
Standard Products Table

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	$V_{0.1mA}$ (V)	ACrms(V)	DC(V)	V_{5A} (V)	(W)	(J)	8x20μsec.(A)	@1kHz(pF)
ERZ-C 05DK220	22 (20~24)	14	18	48	0.01	0.2	50	1300
ERZ-C 05DK270	27 (24~30)	17	22	60	0.01	0.2	50	1050
ERZ-C 05DK330	33 (30~36)	20	26	73	0.01	0.3	50	900
ERZ-C 05DK390	39 (35~43)	25	31	86	0.01	0.3	50	500
ERZ-C 05DK470	47 (42~52)	30	38	104	0.01	0.4	50	450
ERZ-C 05DK560	56 (50~62)	35	45	123	0.01	0.4	50	400
ERZ-C 05DK680	68 (61~75)	40	56	150	0.01	0.6	50	350
ERZ-C 05DK820	82 (74~90)	50	65	155	0.01	0.6	50	300

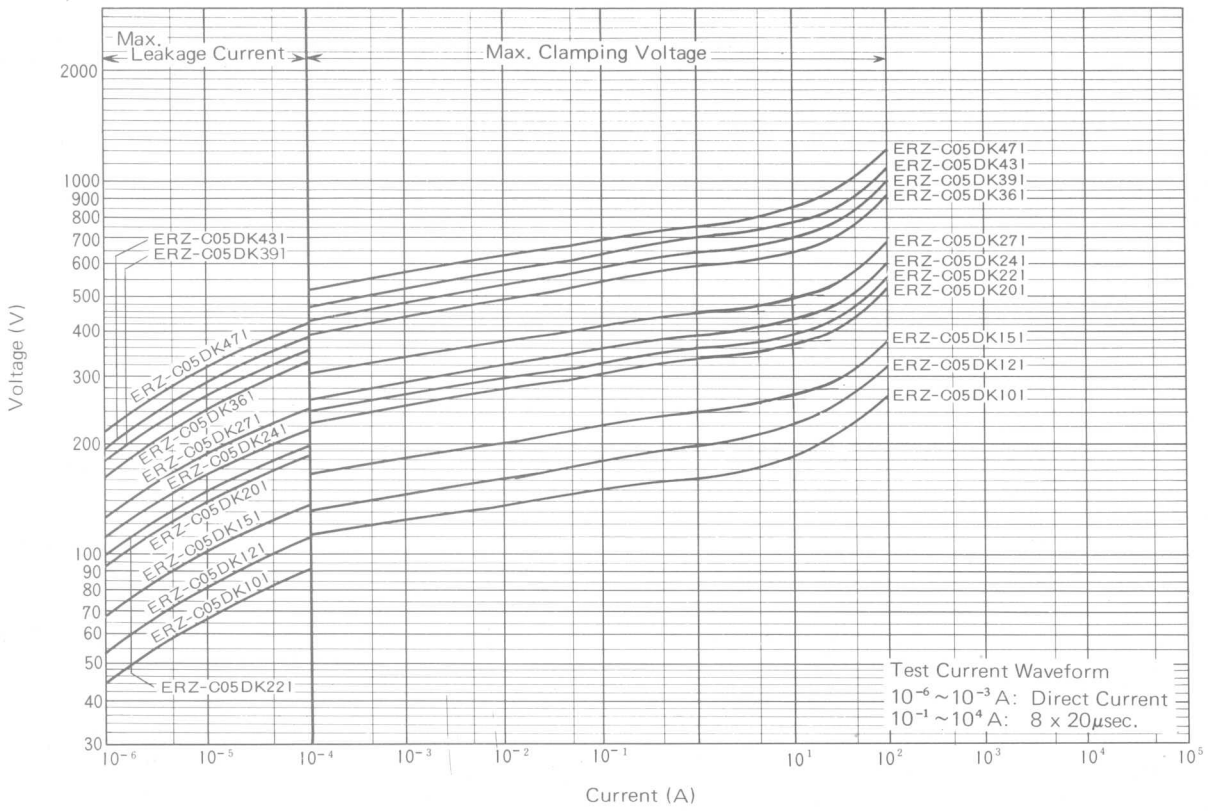
Standard Products Table

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	V0.1mA(V)	ACrms(V)	DC(V)	V5A(V)	(W)	(J)	8x20μsec.(A)	@1kHz (pF)
ERZ-C 05DK101	100 (90–110)	60	85	175	0.1	1.0	100	150
ERZ-C 05DK121	120 (108–132)	75	100	210	0.1	1.0	100	130
ERZ-C 05DK151	150 (135–165)	95	125	260	0.1	1.0	100	100
ERZ-C 05DK201	200 (185–225)	130	170	355	0.1	1.0	100	80
ERZ-C 05DK221	220 (198–242)	140	180	380	0.1	1.0	100	60
ERZ-C 05DK241	240 (216–264)	150	200	415	0.1	1.0	100	60
ERZ-C 05DK271	270 (247–303)	175	225	475	0.1	1.0	100	55
ERZ-C 05DK361	360 (324–396)	230	300	620	0.1	2.5	100	50
ERZ-C 05DK391	390 (351–429)	250	320	675	0.1	2.5	100	50
ERZ-C 05DK431	430 (387–473)	275	350	745	0.1	2.5	100	45
ERZ-C 05DK471	470 (423–517)	300	385	810	0.1	2.5	100	40

V-I Curve (ERZ-C05DK220 ~ ERZ-C05DK820)

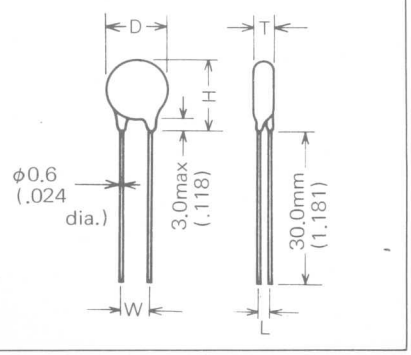


V–I Curve (ERZ–C05DK101 ~ ERZ–C05DK471)



7 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 07DK101	9.0 (.354)	3.7(.146)	5.0 (.197)	12.0 (.472)	1.6(.063)	
ERZ-C 07DK121		3.8(.150)			1.8(.071)	
ERZ-C 07DK151		4.0(.157)			2.0(.079)	
*ERZ-C 07DK201		4.2(.165)			2.0(.079)	
*ERZ-C 07DK221		4.3(.169)			2.1(.083)	
*ERZ-C 07DK241		4.4(.173)			2.2(.087)	
ERZ-C 07DK271		4.6(.181)			2.4(.094)	
ERZ-C 07DK361		5.2(.205)			3.0(.118)	
ERZ-C 07DK391		5.4(.213)			3.2(.126)	
ERZ-C 07DK431		5.7(.224)			3.5(.138)	
ERZ-C 07DK471		6.0(.236)			3.8(.150)	

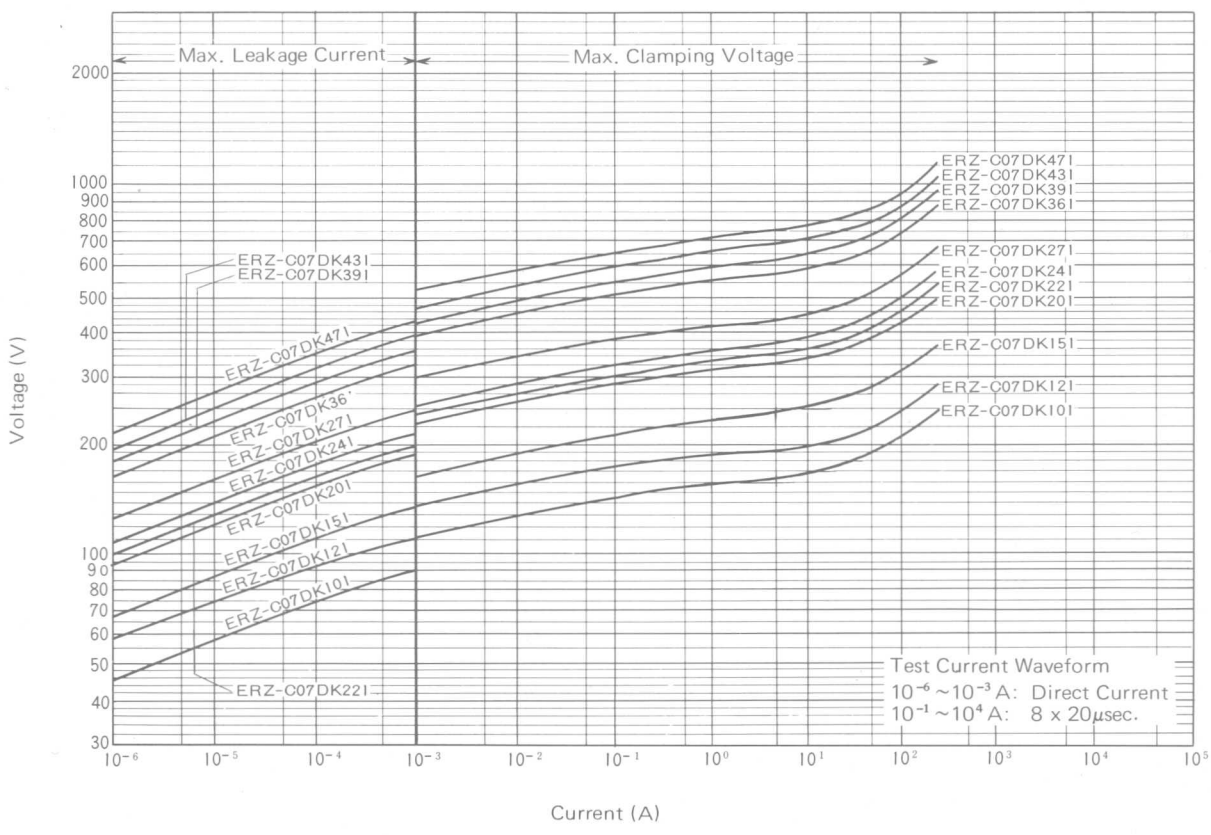
Note *: UL approved.

Standard Products Table

Part No.	Varistor Voltage	Maximum Alowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	V1mA (V)	ACrms(V)	DC(V)	V10A (V)	(W)	(J)	8x20μsec. (A)	@1KHz (pF)
ERZ-C 07DK101	100 (90–110)	60	85	165	0.2	2.0	250	240
ERZ-C 07DK121	120 (108–132)	75	100	200	0.2	2.0	250	220
ERZ-C 07DK151	150 (135–165)	95	125	250	0.2	2.0	250	160
*ERZ-C 07DK201	200 (185–225)	130	170	340	0.2	2.5	250	130
*ERZ-C 07DK221	220 (198–242)	140	180	360	0.2	2.5	250	110
*ERZ-C 07DK241	240 (216–264)	150	200	395	0.2	2.5	250	100
ERZ-C 07DK271	270 (247–303)	175	225	455	0.2	2.5	250	90
ERZ-C 07DK361	360 (324–396)	230	300	595	0.2	5.0	250	80
ERZ-C 07DK391	390 (351–429)	250	320	650	0.2	5.0	250	80
ERZ-C 07DK431	430 (387–473)	275	350	710	0.2	5.0	250	70
ERZ-C 07DK471	470 (423–517)	300	385	775	0.2	5.0	250	70

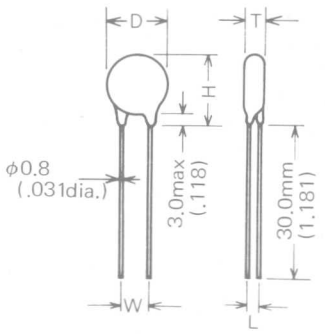
Note *: UL approved.

V–I Curve (ERZ–C07DK101 ~ ERZ–C07DK471)



10 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 10DK220	13.5 (.531)	3.7(.146)	7.5 (.295)	16.5 (.650)	1.4(.055)	
ERZ-C 10DK270		3.8(.150)			1.5(.059)	
ERZ-C 10DK330		4.0(.157)			1.7(.067)	
ERZ-C 10DK390		4.1(.161)			1.8(.071)	
ERZ-C 10DK470		4.0(.157)			1.7(.067)	
ERZ-C 10DK560		4.1(.161)			1.9(.075)	
ERZ-C 10DK680		4.3(.169)			2.2(.087)	
ERZ-C 10DK820		4.0(.157)			1.6(.063)	
ERZ-C 10DK101		4.1(.161)			1.8(.071)	
ERZ-C 10DK121		4.2(.165)			2.0(.079)	
ERZ-C 10DK151		4.5(.177)			2.2(.087)	
*ERZ-C 10DK201		4.6(.181)			2.2(.087)	
*ERZ-C 10DK221		4.7(.185)			2.3(.091)	
*ERZ-C 10DK241		4.8(.181)			2.4(.094)	
ERZ-C 10DK271		5.1(.201)			2.6(.102)	
ERZ-C 10DK361	14.0 (.551)	5.7(.224)		17.0 (.669)	3.2(.126)	
ERZ-C 10DK391		5.8(.228)			3.4(.134)	
ERZ-C 10DK431		6.2(.244)			3.7(.146)	
ERZ-C 10DK471		6.5(.256)			4.0(.157)	
ERZ-C 10DK621		6.2(.244)			3.8(.150)	
ERZ-C 10DK681		6.5(.256)			4.1(.161)	
ERZ-C 10DK751		6.8(.268)			4.4(.173)	
ERZ-C 10DK781		6.9(.272)			4.5(.177)	
ERZ-C 10DK821		7.1(.280)			4.7(.185)	
ERZ-C 10DK911		7.6(.299)			5.2(.205)	
ERZ-C 10DK102		8.0(.315)			5.6(.220)	
ERZ-C 10DK112		8.5(.335)			6.1(.240)	

Note *: UL approved.

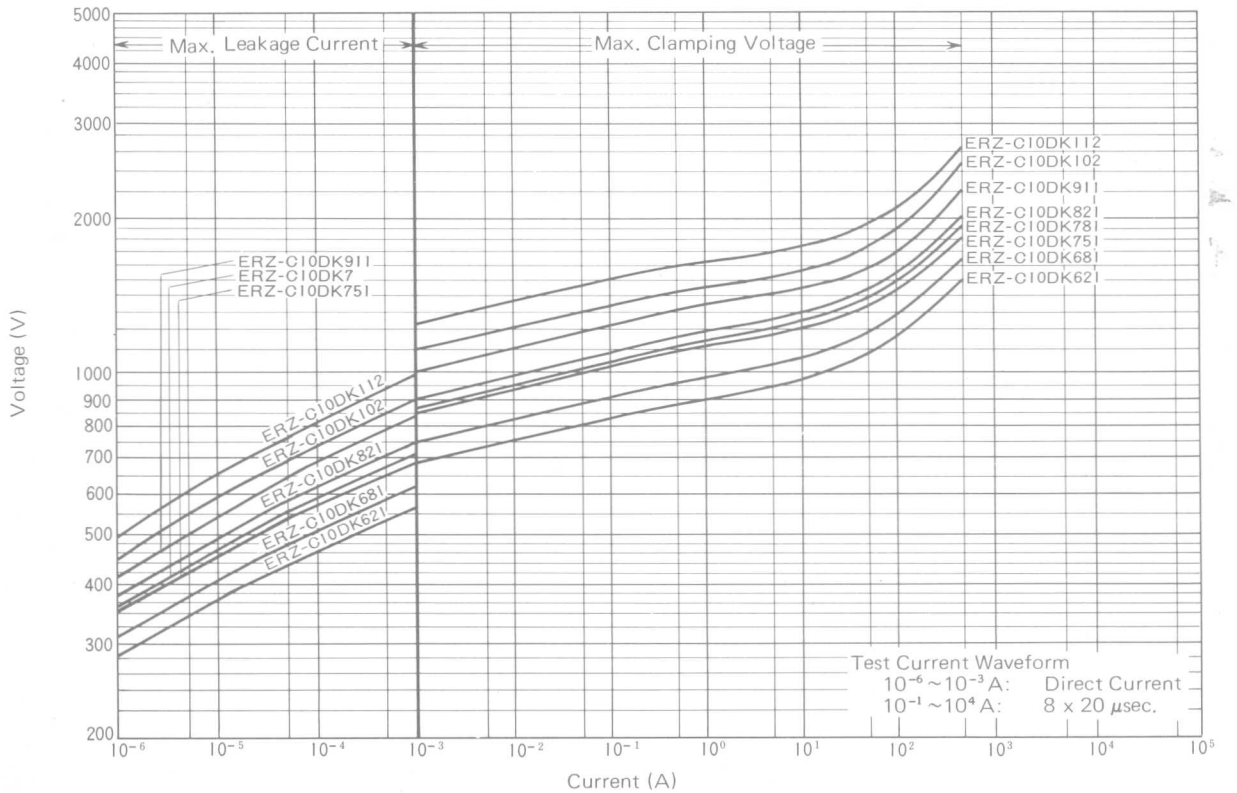
Standard Products Table

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	V1mA(V)	ACrms(V)	DC(V)	V5A (V)	(W)	(J)	8x20μsec. (A)	@1KHz (pF)
ERZ-C 10DK220	22 (20–24)	14	18	43	0.05	0.8	250	6000
ERZ-C 10DK270	27 (24–30)	17	22	53	0.05	1.0	250	4000
ERZ-C 10DK330	33 (30–36)	20	26	65	0.05	1.2	250	3000
ERZ-C 10DK390	39 (35–43)	25	31	77	0.05	1.4	250	2600
ERZ-C 10DK470	47 (42–52)	30	38	93	0.05	1.8	250	2200
ERZ-C 10DK560	56 (50–62)	35	45	110	0.05	2.0	250	1800
ERZ-C 10DK680	68 (61–75)	40	56	135	0.05	2.5	250	1300

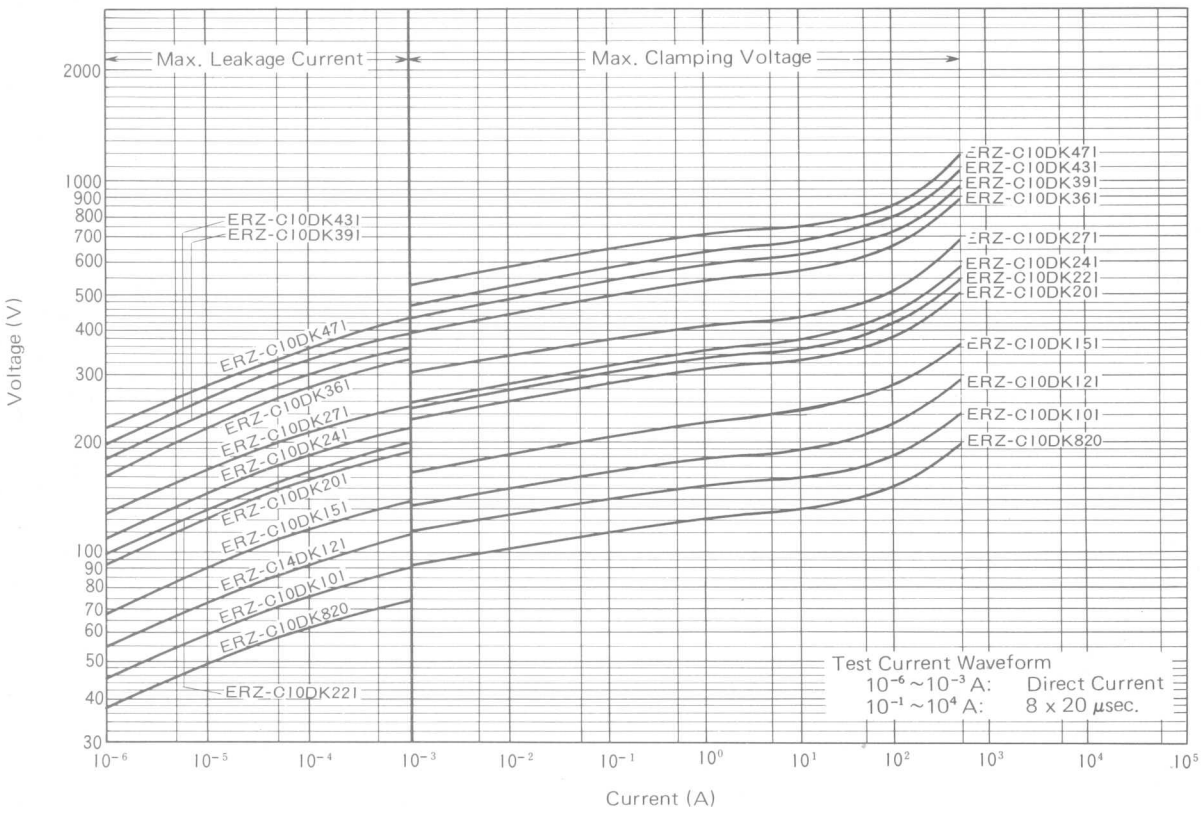
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	V_{1mA} (V)	ACrms (V)	DC (V)	V_{25A} (V)	(W)	(J)	8x20μsec. (A)	@1KHz (pF)
ERZ-C 10DK820	82 (74– 90)	50	65	135	0.4	2	500	700
ERZ-C 10DK101	100 (90– 110)	60	85	165	0.4	4	500	600
ERZ-C 10DK121	120 (108– 132)	75	100	200	0.4	4	500	500
ERZ-C 10DK151	150 (135– 165)	95	125	250	0.4	4	500	450
*ERZ-C 10DK201	200 (185– 225)	130	170	340	0.4	5	500	400
*ERZ-C 10DK221	220 (198– 242)	140	180	360	0.4	5	500	300
*ERZ-C 10DK241	240 (216– 264)	150	200	395	0.4	5	500	250
ERZ-C 10DK271	270 (247– 303)	175	225	455	0.4	5	500	250
ERZ-C 10DK361	360 (324– 396)	230	300	595	0.4	10	500	200
ERZ-C 10DK391	390 (351– 429)	250	320	650	0.4	10	500	180
ERZ-C 10DK431	430 (387– 473)	275	350	710	0.4	10	500	180
ERZ-C 10DK471	470 (423– 517)	300	385	775	0.4	10	500	150
ERZ-C 10DK621	620 (558– 682)	385	505	1025	0.4	10	500	150
ERZ-C 10DK681	680 (612– 748)	420	560	1120	0.4	10	500	130
ERZ-C 10DK751	750 (675– 825)	460	615	1240	0.4	20	500	120
ERZ-C 10DK781	780 (702– 858)	485	640	1290	0.4	20	500	120
ERZ-C 10DK821	820 (738– 902)	510	670	1355	0.4	20	500	120
ERZ-C 10DK911	910 (819–1001)	550	745	1500	0.4	20	500	100
ERZ-C 10DK102	1000 (900–1100)	625	825	1650	0.4	20	500	100
ERZ-C 10DK112	1100 (990–1210)	680	895	1815	0.4	20	500	80

Note *: UL approved.

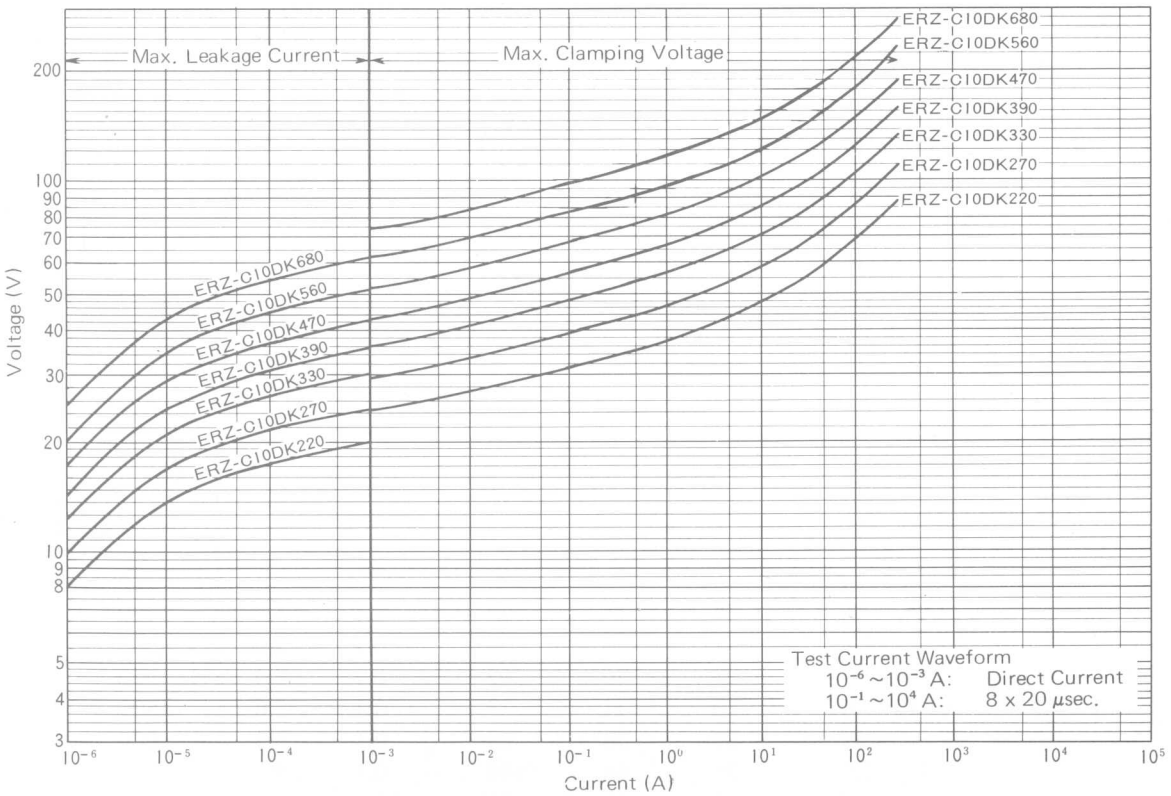
V–I Curve (ERZ–C10DK621 ~ ERZ–C10DK112)



V–I Curve (ERZ–C10DK820 ~ ERZ–C10DK471)

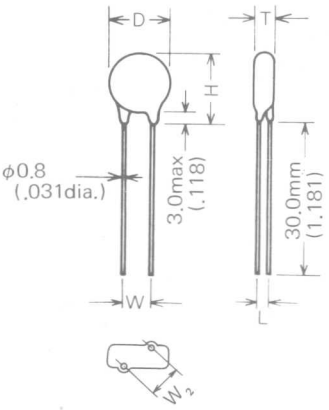


V–I Curve (ERZ–C10DK220 ~ ERZ–C10DK680)



14 Series

Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 14DK220	17.0 (.669)	3.7(.146)	7.5 (.295)	20.0 (.787)	1.4(.055)	
ERZ-C 14DK270		3.8(.150)			1.5(.059)	
ERZ-C 14DK330		4.0(.157)			1.7(.067)	
ERZ-C 14DK390		4.1(.161)			1.8(.071)	
ERZ-C 14DK470		4.0(.157)			1.7(.067)	
ERZ-C 14DK560		4.1(.161)			1.9(.075)	
ERZ-C 14DK680		4.3(.169)			2.2(.087)	
ERZ-C 14DK820		4.0(.157)			1.6(.063)	
ERZ-C 14DK101		4.1(.161)			1.8(.071)	
ERZ-C 14DK121		4.2(.165)			2.0(.079)	
ERZ-C 14DK151		4.5(.177)			2.2(.087)	
*ERZ-C 14DK201		4.6(.181)			2.2(.087)	
*ERZ-C 14DK221		4.7(.185)			2.3(.091)	
*ERZ-C 14DK241		4.8(.189)			2.4(.094)	
ERZ-C 14DK271		5.1(.201)			2.6(.102)	
ERZ-C 14DK361	17.5 (.689)	5.7(.224)		20.5 (.807)	3.2(.126)	
ERZ-C 14DK391		5.8(.228)			3.4(.134)	
ERZ-C 14DK431		6.2(.244)			3.7(.146)	
ERZ-C 14DK471		6.5(.256)			4.0(.157)	
ERZ-C 14DK621		6.2(.244)			3.8(.150)	
ERZ-C 14DK681		6.5(.256)			4.1(.161)	
ERZ-C 14DK751		6.8(.268)			4.4(.173)	
ERZ-C 14DK781		6.9(.272)			4.5(.177)	
ERZ-C 14DK821		7.1(.280)			4.7(.185)	
ERZ-C 14DK911		7.6(.299)			5.2(.205)	
ERZ-C 14DK102		8.0(.315)			5.6(.220)	
ERZ-C 14DK112		8.5(.335)			6.1(.240)	
ERZ-C 14DK182		12.0±2.0 (.472±.079)	*15.0 (.591)	22.0 (.866)	9.5±2.0 (.374±.079)	

Note *: UL approved.
*: W_2

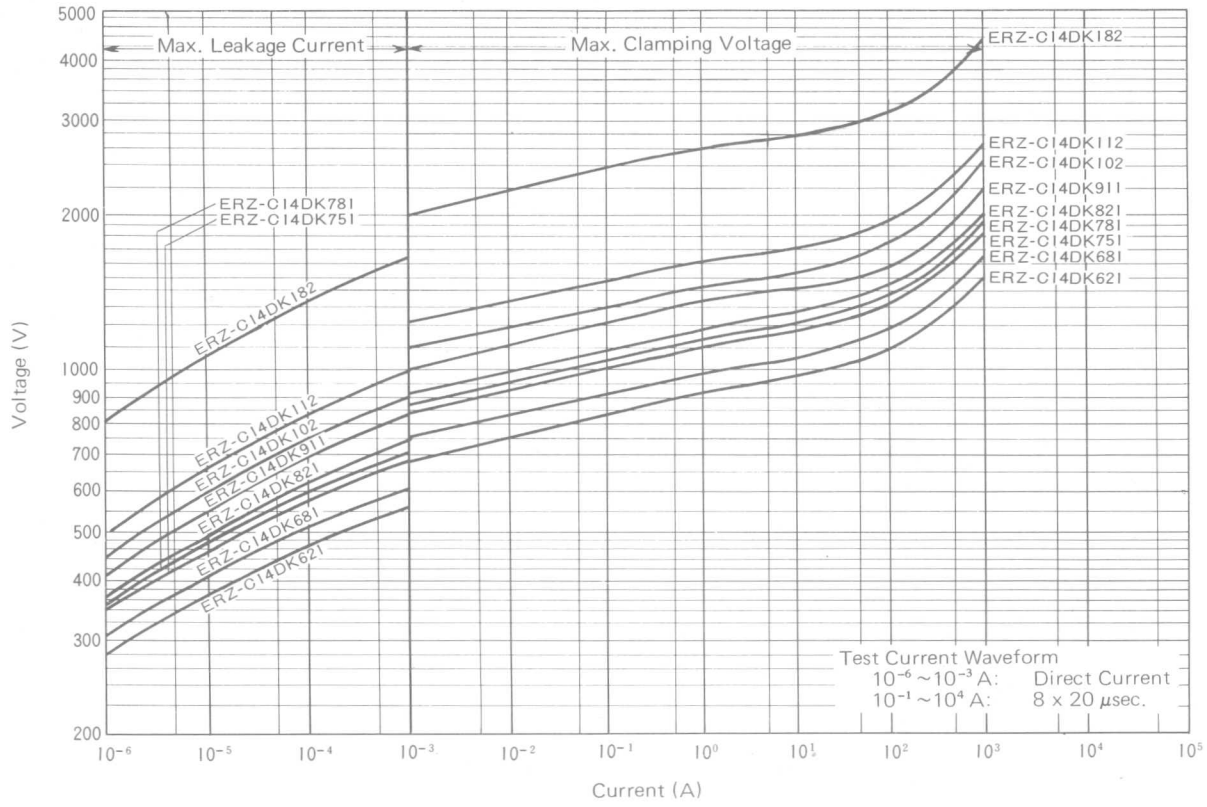
Standard Products Table

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	V_{1mA} (V)	ACrms(V)	DC(V)	V_{10A} (V)	(W)	(J)	8x20μsec. (A)	@1KHz (pF)
ERZ-C 14DK220	22 (20–24)	14	18	43	0.1	1.6	500	15000
ERZ-C 14DK270	27 (24–30)	17	22	53	0.1	1.9	500	10000
ERZ-C 14DK330	33 (30–36)	20	26	65	0.1	2.4	500	7500
ERZ-C 14DK390	39 (35–43)	25	31	77	0.1	2.8	500	6500
ERZ-C 14DK470	47 (42–52)	30	38	93	0.1	3.3	500	5500
ERZ-C 14DK560	56 (50–62)	35	45	110	0.1	4.0	500	4500
ERZ-C 14DK680	68 (61–75)	40	56	135	0.1	4.8	500	3300

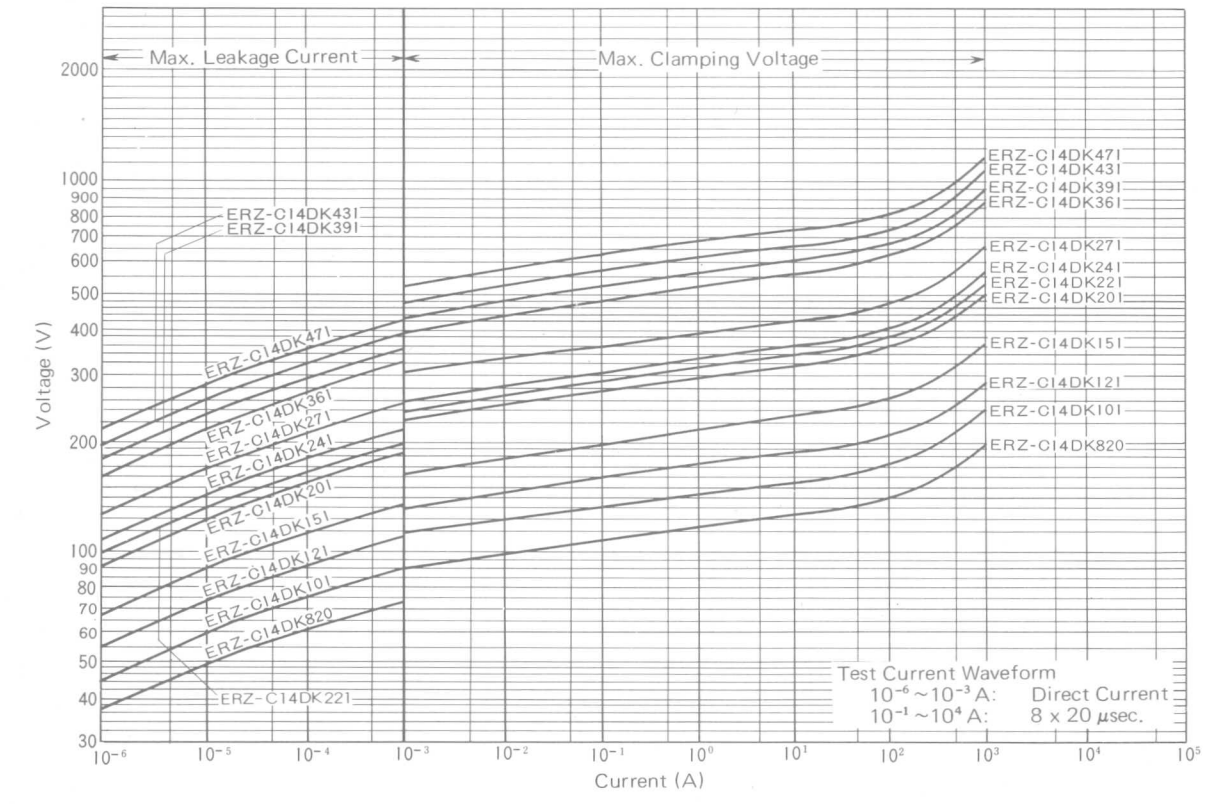
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	V1mA (V)	ACrms(V)	DC(V)	V50A (V)	(W)	(J)	8x20μsec. (A)	@1KHz (pF)
ERZ-C 14DK820	82 (74– 90)	50	65	135	0.6	5	1000	2000
ERZ-C 14DK101	100 (90– 110)	60	85	165	0.6	8	1000	1800
ERZ-C 14DK121	120 (108– 132)	75	100	200	0.6	8	1000	1500
ERZ-C 14DK151	150 (135– 165)	95	125	250	0.6	8	1000	1100
***ERZ-C 14DK201**	200 (185– 225)	130	170	340	0.6	10	1000	1000
***ERZ-C 14DK221**	220 (198– 242)	140	180	360	0.6	10	1000	1000
***ERZ-C 14DK241**	240 (216– 264)	150	200	395	0.6	10	1000	850
ERZ-C 14DK271	270 (247– 303)	175	225	455	0.6	10	1000	700
ERZ-C 14DK361	360 (324– 396)	230	300	595	0.6	20	1000	600
ERZ-C 14DK391	390 (351– 429)	250	320	650	0.6	20	1000	600
ERZ-C 14DK431	430 (387– 473)	275	350	710	0.6	20	1000	500
ERZ-C 14DK471	470 (423– 517)	300	385	775	0.6	20	1000	400
ERZ-C 14DK621	620 (558– 682)	385	505	1025	0.6	20	1000	350
ERZ-C 14DK681	680 (612– 748)	420	560	1120	0.6	20	1000	350
ERZ-C 14DK751	750 (675– 825)	460	615	1240	0.6	40	1000	300
ERZ-C 14DK781	780 (702– 858)	485	640	1290	0.6	40	1000	300
ERZ-C 14DK821	820 (738– 902)	510	670	1355	0.6	40	1000	300
ERZ-C 14DK911	910 (819–1001)	550	745	1500	0.6	40	1000	300
ERZ-C 14DK102	1000 (900–1100)	625	825	1650	0.6	40	1000	200
ERZ-C 14DK112	1100 (990–1210)	680	895	1815	0.6	40	1000	200
ERZ-C 14DK182	1800 (1620–1980)	1000	1465	2970	0.6	80	1000	150

Note *: UL approved.

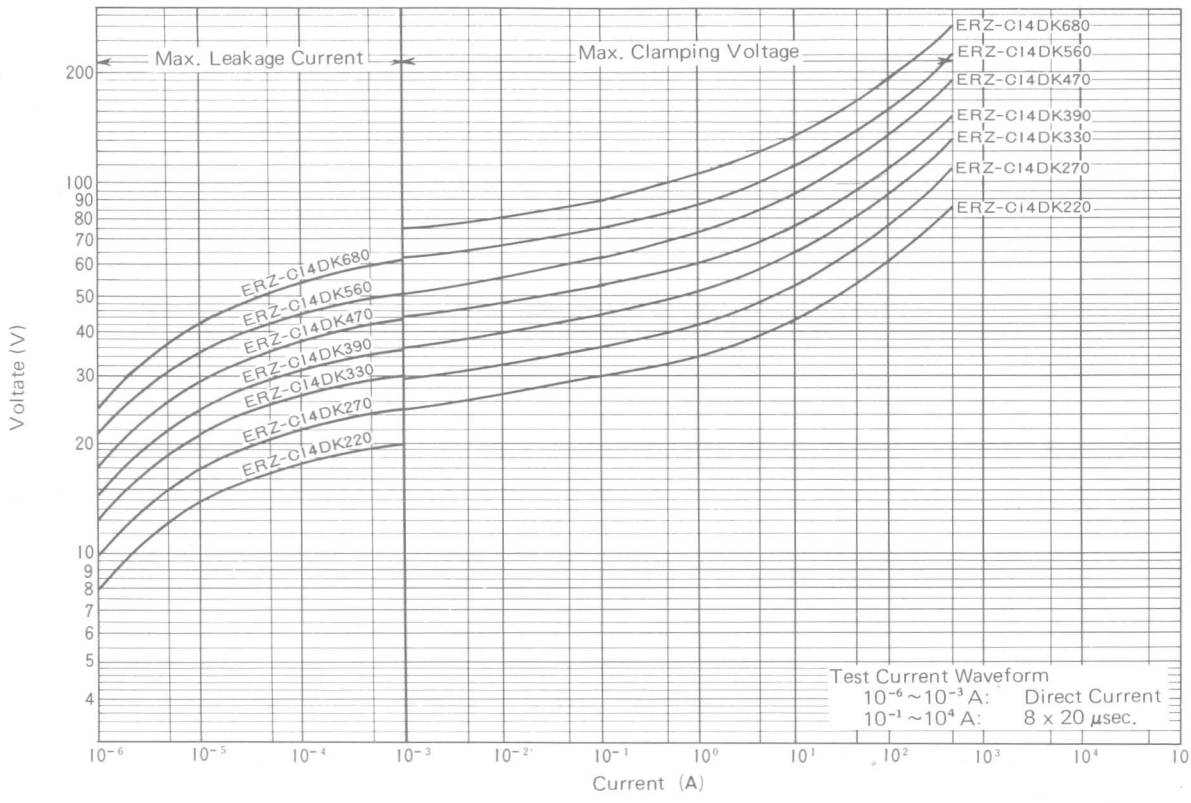
V–I Curve (ERZ–C14DK621 ~ ERZ–C14DK182)



V–I Curve (ERZ–C14DK820 ~ ERZ–C14DK471)

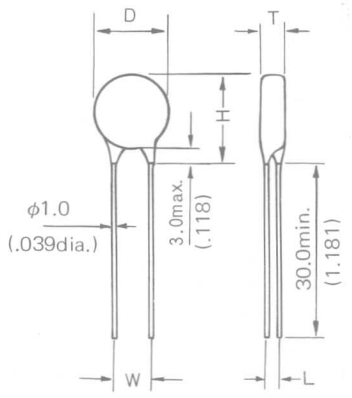


V–I Curve (ERZ–C14DK220 ~ ERZ–C14DK680)



20 Series

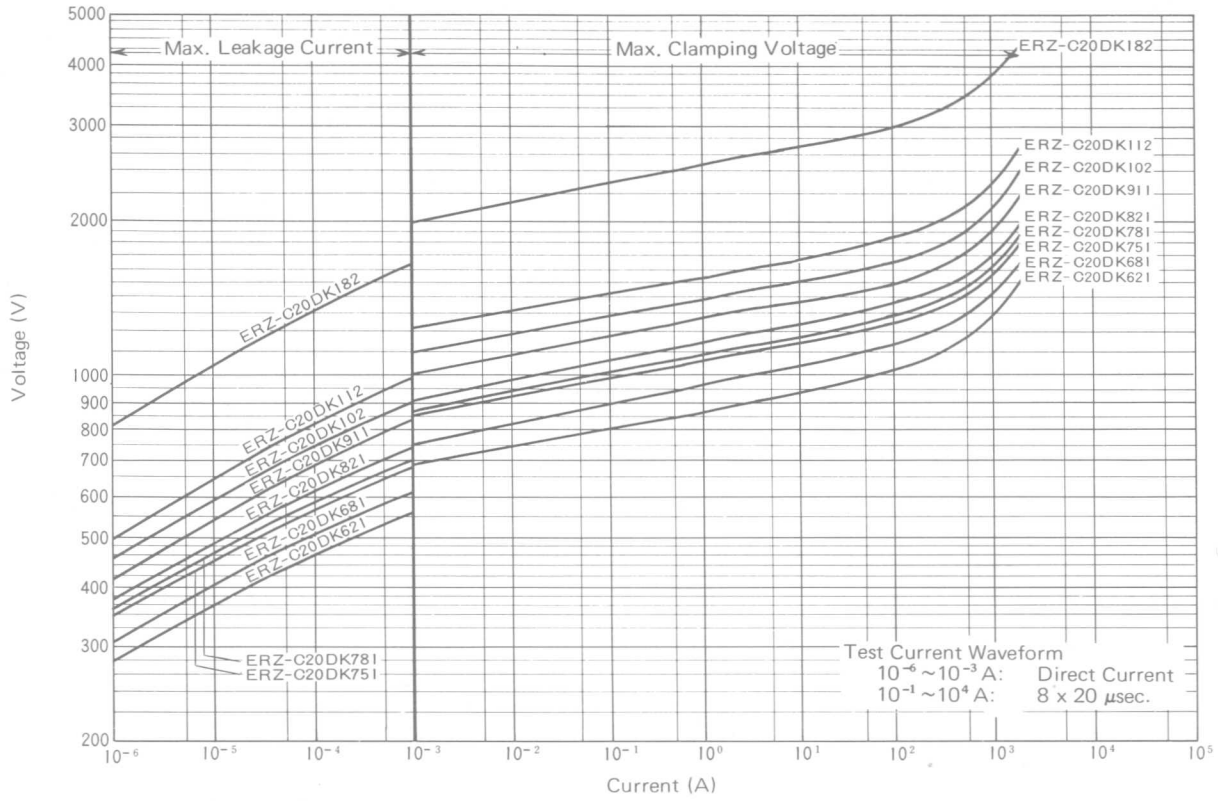
Dimensions

Part No.	Dmax.	T±1.0(.039)	W±1.0(.039)	Hmax.	L±1.0(.039)	Dimensions mm(in.)
ERZ-C 20DK101	23.0 (.906)	4.6(.181)	10.0 (0.394)	27.0 (1.063)	2.0(.079)	
ERZ-C 20DK121		4.7(.185)			2.2(.087)	
ERZ-C 20DK151		4.9(.193)			2.4(.094)	
ERZ-C 20DK201		5.0(.197)			2.4(.094)	
ERZ-C 20DK221		5.2(.205)			2.6(.102)	
ERZ-C 20DK241		5.3(.209)			2.7(.106)	
ERZ-C 20DK271		5.5(.217)			2.9(.114)	
ERZ-C 20DK361	24.0 (.945)	6.2(.244)		28.0 (1.102)	3.5(.138)	
ERZ-C 20DK391		6.4(.252)			3.7(.146)	
ERZ-C 20DK431		6.7(.264)			4.0(.157)	
ERZ-C 20DK471		7.0(.276)			4.3(.169)	
ERZ-C 20DK621		6.6(.260)			4.1(.161)	
ERZ-C 20DK681		6.9(.272)			4.4(.173)	
ERZ-C 20DK751		7.3(.287)			4.8(.189)	
ERZ-C 20DK781		7.4(.291)			4.9(.193)	
ERZ-C 20DK821		7.6(.299)			5.1(.201)	
ERZ-C 20DK911		8.1(.319)			5.6(.220)	
ERZ-C 20DK102		8.5(.335)			6.0(.236)	
ERZ-C 20DK112		9.0(.354)			6.5(.256)	
ERZ-C 20DK182	25.0 (.984)	12.0±2.0 (.472±.079)	15.0 (.591)	30.0 (1.181)	9.5±2.0 (.374±.079)	

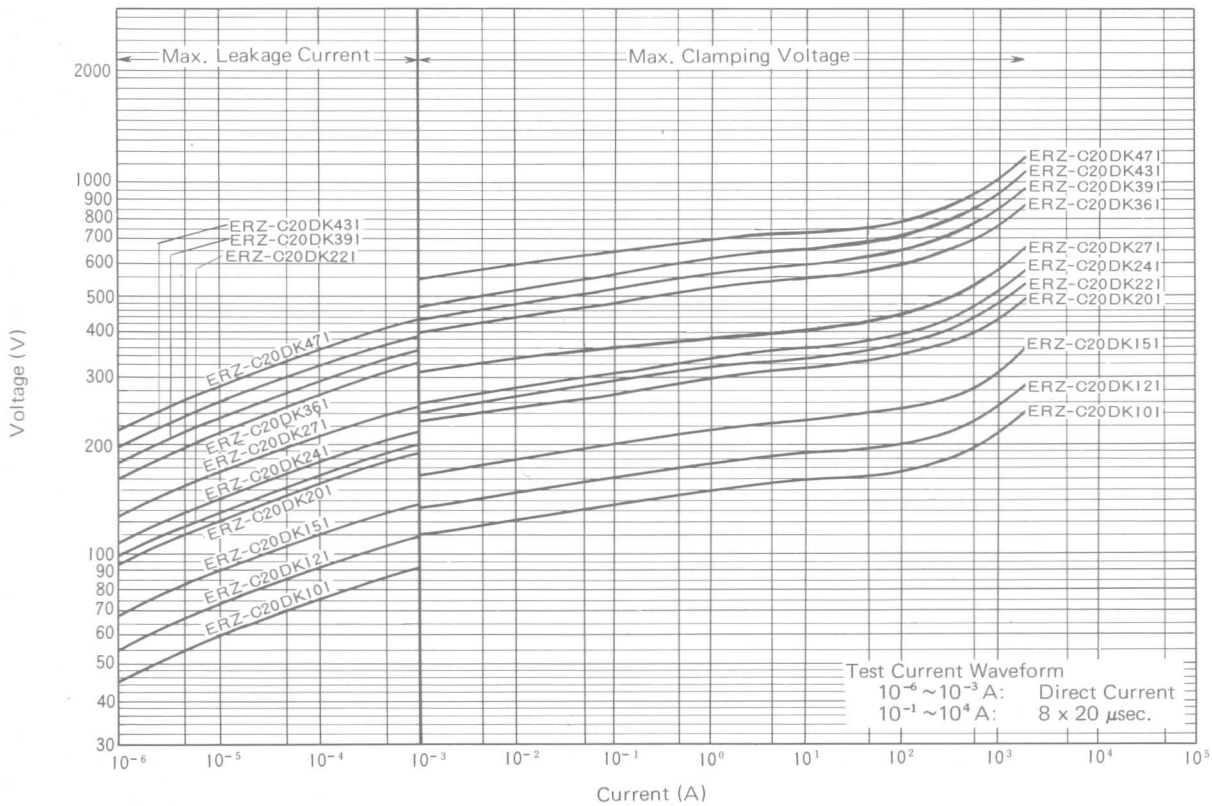
Standard Products Table

Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage	Rated Wattage	Energy	Withstanding Surge Current	Typical Capacitance
	V1mA (V)	ACrms(V)	DC(V)	V100A (V)	(W)	(J)	8x20μsec.(A)	@1KHz (pF)
ERZ-C 20DK101	100(90– 110)	60	85	165	0.8	15	2000	4800
ERZ-C 20DK121	120(108– 132)	75	100	200	0.8	15	2000	3000
ERZ-C 20DK151	150(135– 165)	95	125	250	0.8	15	2000	2600
ERZ-C 20DK201	200(185– 225)	130	170	340	0.8	20	2000	2300
ERZ-C 20DK221	220(198– 242)	140	180	360	0.8	20	2000	2000
ERZ-C 20DK241	240(212– 264)	150	200	395	0.8	20	2000	1500
ERZ-C 20DK271	270(247– 303)	175	225	455	0.8	20	2000	1400
ERZ-C 20DK361	360(324– 396)	230	300	595	0.8	40	2000	1300
ERZ-C 20DK391	390(351– 429)	250	320	650	0.8	40	2000	1200
ERZ-C 20DK431	430(387– 473)	275	350	710	0.8	40	2000	1000
ERZ-C 20DK471	470(423– 517)	300	385	775	0.8	40	2000	900
ERZ-C 20DK621	620(558– 682)	385	505	1025	0.8	40	2000	900
ERZ-C 20DK681	680(612– 748)	420	560	1120	0.8	40	2000	850
ERZ-C 20DK751	750(675– 825)	460	615	1240	0.8	80	2000	800
ERZ-C 20DK781	780(702– 858)	485	640	1290	0.8	80	2000	800
ERZ-C 20DK821	820(738– 902)	510	670	1355	0.8	80	2000	700
ERZ-C 20DK911	910(819–1001)	550	745	1500	0.8	80	2000	700
ERZ-C 20DK102	1000(900–1100)	625	825	1650	0.8	80	2000	500
ERZ-C 20DK112	1100(990–1210)	680	895	1815	0.8	80	2000	400
ERZ-C 20DK182	1800(1620–1980)	1000	1465	2970	0.8	160	2000	300

V–I Curve (ERZ–C20DK621 ~ ERZ–C20DK182)

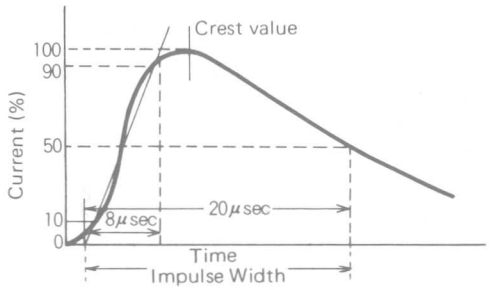


V–I Curve (ERZ–C20DK101 ~ ERZ–C20DK471)



Ratings

Electrical Ratings

Item	Test Condition/Description	Requirement
Varistor Voltage	The voltage between two terminals with the specified measuring current CmA DC applied is called Vc. The measurement shall be made as fast as possible to avoid heat affection.	
Maximum Allowable Voltage	The recommended maximum sine wave voltage (rms) or the maximum DC voltage that can be applied continuously.	
Maximum Clamping Voltage	The maximum voltage between two terminals with the specified standard impulse current (8 x 20 μsec.) illustrated below applied. 	To meet the specified value.
Rated Wattage	The maximum power that can be applied within the specified ambient temperature.	
Energy	The maximum energy within the varistor voltage change of ±10% when one impulse of 2msec. is applied.	
Withstanding Surge Current	The maximum current within the varistor voltage change of ±10% with the standard impulse current (8 x 20 μsec.) applied two times with 5-minute interval.	
Varistor Voltage Temperature Coefficient	$\frac{\text{Vc at } 20^\circ\text{C}(68^\circ\text{F}) - \text{Vc at } 70^\circ\text{C}(158^\circ\text{F})}{\text{Vc at } 20^\circ\text{C } (68^\circ\text{F})} \times \frac{1}{50} \times 100(\%/^\circ\text{C})$	−0.05%/°C max.
Surge Life	The change of Vc shall be measured after the impulse listed below is applied 10,000 times continuously with the interval of ten seconds at room temperature	$\frac{\triangle Vc}{Vc} \leqq \pm 10\%$

5 Series	ERZ-C05DK220 to ERZ-C05DK820	0.5A (2msec.)
	ERZ-C05DK101 to ERZ-C05DK471	20A (8x20 μsec.)
7 Series		50A (8x20 μsec.)
10 Series	ERZ-C10DK220 to ERZ-C10DK680	50A (8x20 μsec.)
	ERZ-C10DK820 to ERZ-C10DK112	100A (8x20 μsec.)
14 Series	ERZ-C14DK220 to ERZ-C14DK680	75A (8x20 μsec.)
	ERZ-C14DK820 to ERZ-C14DK182	150A (8x20 μsec.)
20 Series		200A (8x20 μsec.)

Note: The test shall be done in general at 20°C (68°F), 65% RH.

Mechanical Ratings

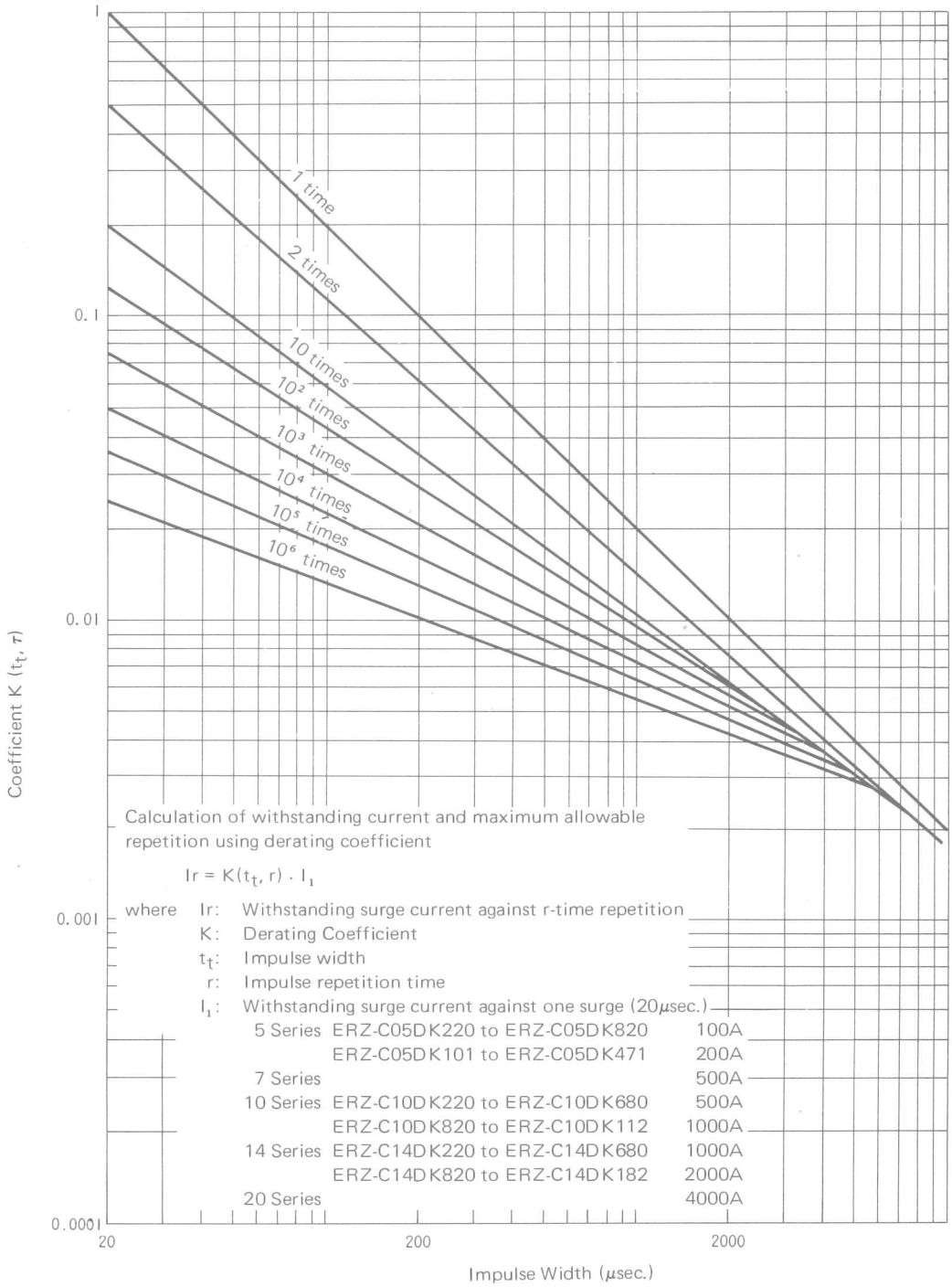
Item	Test Condition/Description	Requirement
Terminal Pull Strength	After gradually applying the load specified below and keeping the unit fixed for ten seconds, the terminal shall be visually examined for any damage. Terminal diameter — Load 0.6mm (.024") — 0.5kg (1.1lbs.) 0.8mm (.031") — 1.0kg (2.2lbs.) 1.0mm (.039") — 2.0kg (4.4lbs.)	No outstanding damage
Terminal Bending Strength	The unit shall be secured with its terminal kept vertical and the weight specified below be applied in the axial direction. The terminal shall gradually be bent by 90° in one direction, then 90° in the opposite direction, and again back to the original position. The damage of the terminal shall be visually examined. Terminal diameter — Load 0.6mm (.025") — 0.25kg (0.55lbs.) 0.8mm (.031") — 0.5 kg (1.1 lbs.) 1.0mm (.039") — 1.0 kg (2.2 lbs.)	
Vibration	Subjected to simple harmonic motion of 0.75mm (.010") amplitude – 1.5mm (.020") maximum total excursion – between limits of 10 - 55Hz. Frequency scan shall be traversed in one minute. This motion shall then be applied for period of two hours in each of three mutually perpendicular directions. Thereafter, the unit shall be visually examined.	
Solderability	After dipping the terminal to a depth of approximately 3mm(.118") from the body in a soldering bath of 260°C (500°F) for three seconds, the terminal shall be visually examined.	Almost all the surface should be covered with solder uniformly.
Resistance to Soldering Heat	The terminal shall be dipped into a soldering bath having a temperature of 350°C (660°F) to a point 3mm (.118") from the body of the unit and then be held there for three seconds. The change of Vc and mechanical damage shall be examined.	$\triangle VcmA/VcmA \leqq \pm 5\%$ No outstanding damage

Environmental Ratings

Item	Test Condition/Description	Requirement
High Temperature Storage	The specimen shall be subjected to 125°C (257°F) for 1000 hours in a thermostatic bath without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.	$\triangle VcmA/VcmA \leqq \pm 5\%$
Humidity	The specimen shall be subjected to 40°C (104°F), 90 to 95% R.H. for 1000 hours without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.	
Thermal Shock	The temperature cycle shown below shall be repeated five times and then stored at room temperature and humidity for one to two hours. The change of Vc as well as mechanical damage shall be examined. Step — Temperature — Period 1 — –25°C(–13°F) — 30 minutes 2 — 85°C(185°F) — 30 minutes	
High Temperature Operation	After being continuously applied the maximum allowable voltate at 85°C (185°F) for 1000 hours, the specimen shall be stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.	$\triangle VcmA/VcmA \leqq \pm 10\%$

Derating Coefficient (Relation between impulse width and surge repetition time)

5 Series (ERZ-C05DK220 ~ ERZ-C05DK820)



Calculation of withstanding current and maximum allowable repetition using derating coefficient

$$Ir = K(t_t, r) \cdot I_1$$

where
- Ir: Withstanding surge current against r-time repetition
- K: Derating Coefficient
- t_t: Impulse width
- r: Impulse repetition time
- I_1: Withstanding surge current against one surge (20μsec.)

5 Series	ERZ-C05DK220 to ERZ-C05DK820	100A
	ERZ-C05DK101 to ERZ-C05DK471	200A
7 Series		500A
10 Series	ERZ-C10DK220 to ERZ-C10DK680	500A
	ERZ-C10DK820 to ERZ-C10DK112	1000A
14 Series	ERZ-C14DK220 to ERZ-C14DK680	1000A
	ERZ-C14DK820 to ERZ-C14DK182	2000A
20 Series		4000A

Calculation Example

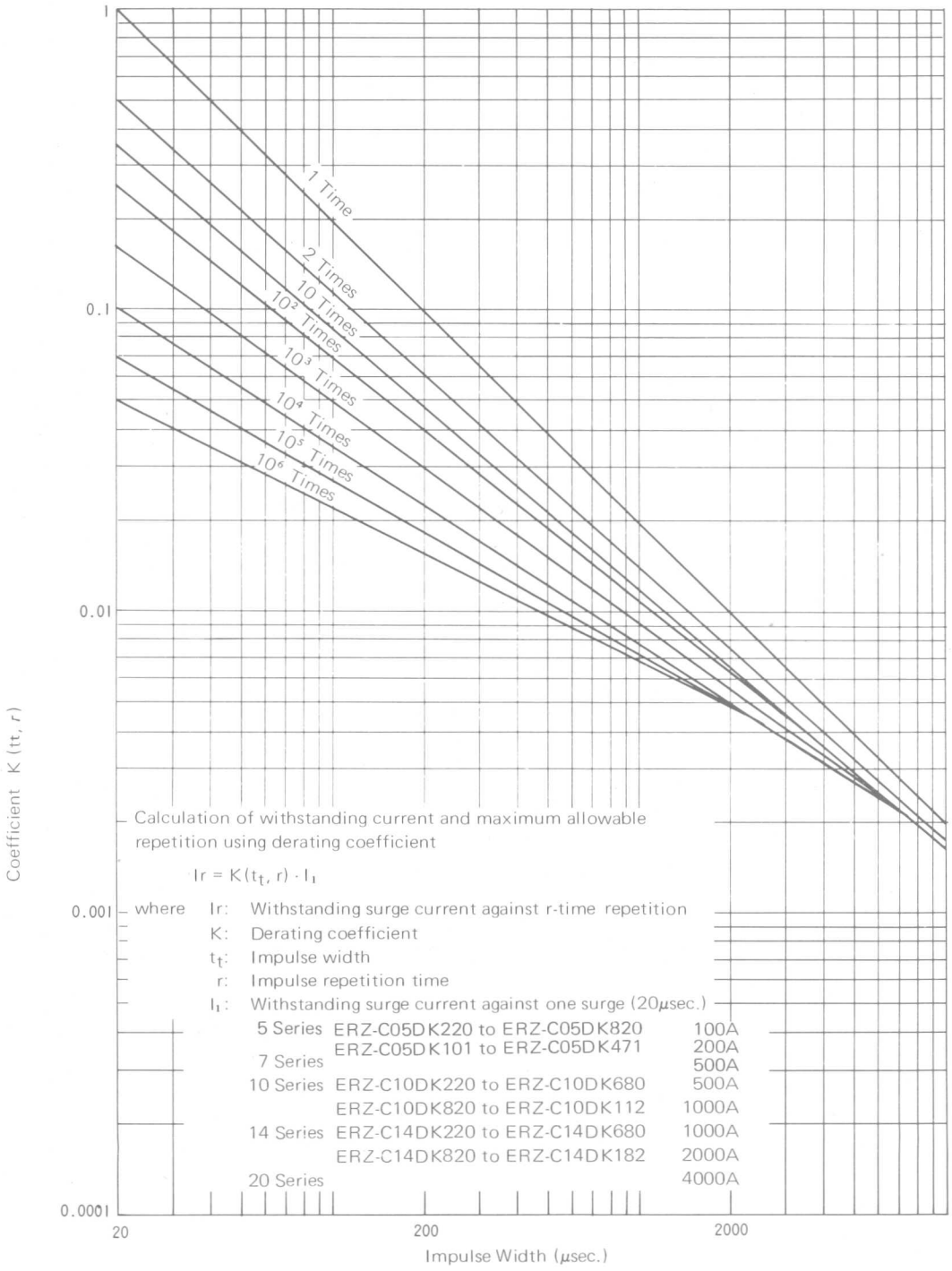
Withstanding surge current of ERZ-C10DK201

Given: Impulse width (t_t): 2000μsec.
Repetition(r): 10^4 times

Calculation: K (2000, 10^4) = 0.005
Accordingly, I_{10^4} = 0.005 x 1000 = 5(A)

Derating Coefficient (Relation between impulse width and surge repetition time)

5 Series (ERZ-C05DK101 ~ ERZ-C05DK471), 7 Series, 10 Series



Calculation of withstanding current and maximum allowable repetition using derating coefficient

$$Ir = K(t_t, r) \cdot I_1$$

where Ir: Withstanding surge current against r-time repetition
K: Derating coefficient
t_t: Impulse width
r: Impulse repetition time
I_1: Withstanding surge current against one surge (20μsec.)

5 Series	ERZ-C05DK220 to ERZ-C05DK820	100A
	ERZ-C05DK101 to ERZ-C05DK471	200A
7 Series		500A
10 Series	ERZ-C10DK220 to ERZ-C10DK680	500A
	ERZ-C10DK820 to ERZ-C10DK112	1000A
14 Series	ERZ-C14DK220 to ERZ-C14DK680	1000A
	ERZ-C14DK820 to ERZ-C14DK182	2000A
20 Series		4000A

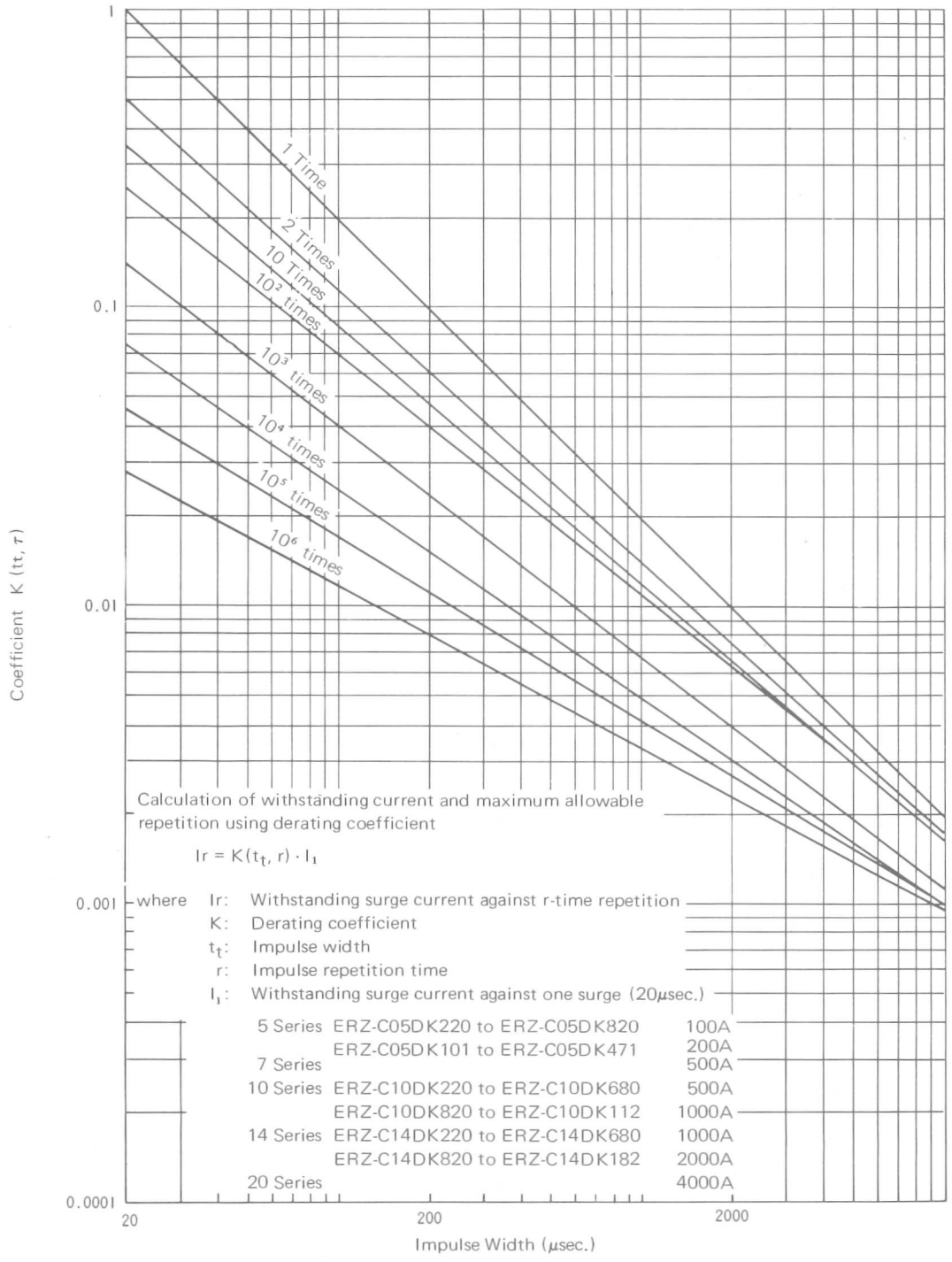
Calculation Example

Withstanding surge current of ERZ-C10DK201

Given: Impulse width (t_t): 2000μsec.
Repetition(r): 10^4 times

Calculation: K (2000, 10^4) = 0.005
Accordingly, I_{10^4}=0.005 x 1000=5(A)

14 Series



Calculation of withstanding current and maximum allowable repetition using derating coefficient

$$Ir = K(t_t, r) \cdot I_1$$

where Ir: Withstanding surge current against r-time repetition
K: Derating coefficient
t_t: Impulse width
r: Impulse repetition time
I_1: Withstanding surge current against one surge (20μsec.)

5 Series	ERZ-C05DK220 to ERZ-C05DK820	100A
	ERZ-C05DK101 to ERZ-C05DK471	200A
7 Series		500A
10 Series	ERZ-C10DK220 to ERZ-C10DK680	500A
	ERZ-C10DK820 to ERZ-C10DK112	1000A
14 Series	ERZ-C14DK220 to ERZ-C14DK680	1000A
	ERZ-C14DK820 to ERZ-C14DK182	2000A
20 Series		4000A

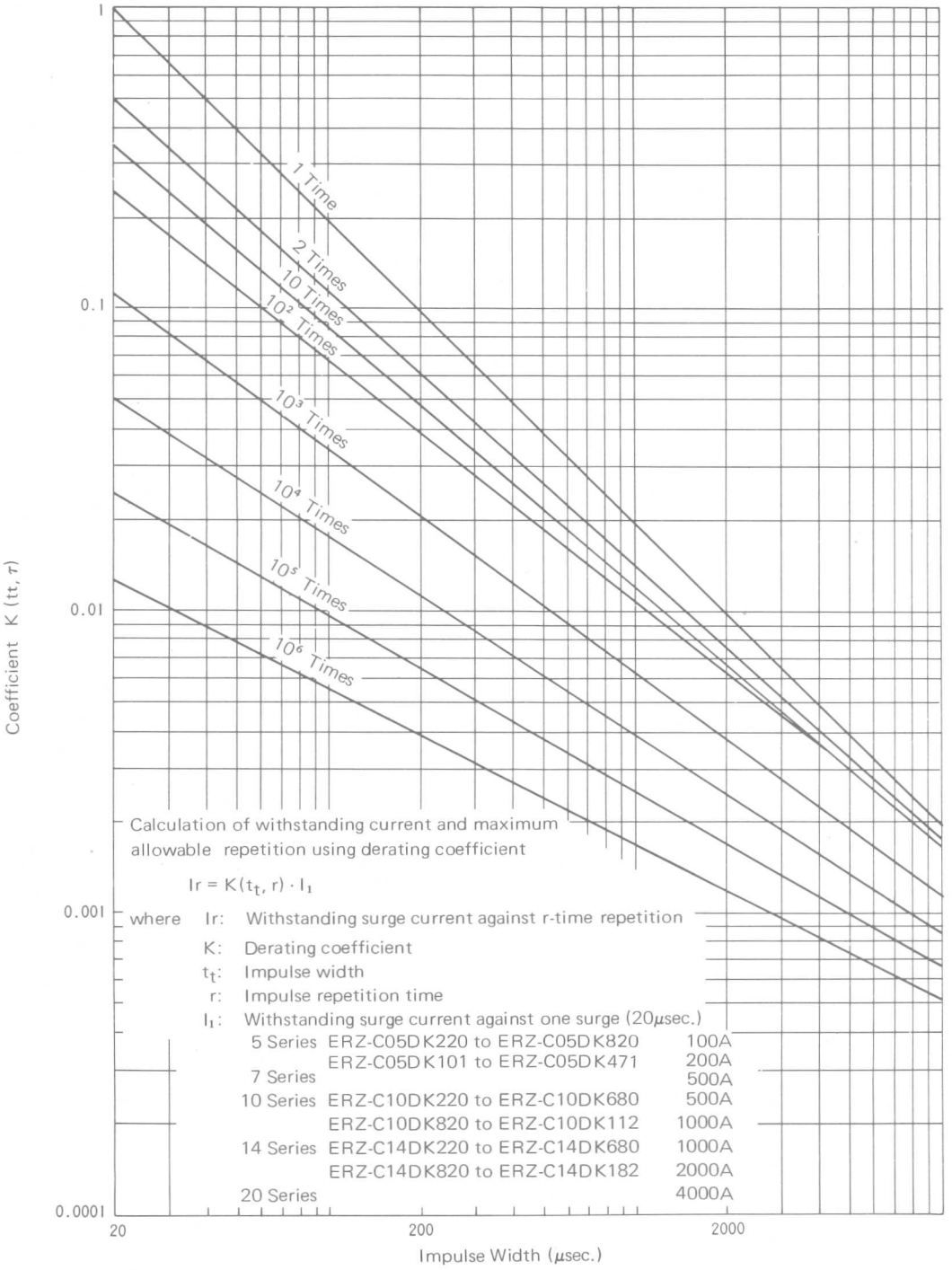
Calculation Example

Maximum permissible repetition of ERZ-C14DK221

Given: Wave tail width (t_t): 200μsec.
Surge current (Ir): 20A

Calculation: I_j=2000A
$20 = K(200,r) \cdot 2000$
$K(200,r) = 0.001$
Accordingly, $r = 10^5$ (times)

20 Series



Calculation of withstanding current and maximum allowable repetition using derating coefficient

$Ir = K(t_t, r) \cdot I_1$

where Ir: Withstanding surge current against r-time repetition
K: Derating coefficient
t_t: Impulse width
r: Impulse repetition time
I_1: Withstanding surge current against one surge (20μsec.)

5 Series	ERZ-C05DK220 to ERZ-C05DK820	100A
	ERZ-C05DK101 to ERZ-C05DK471	200A
7 Series		500A
10 Series	ERZ-C10DK220 to ERZ-C10DK680	500A
	ERZ-C10DK820 to ERZ-C10DK112	1000A
14 Series	ERZ-C14DK220 to ERZ-C14DK680	1000A
	ERZ-C14DK820 to ERZ-C14DK182	2000A
20 Series		4000A

Selection of the optimum ZNR

Given: Wave tail width (t_t): 100μsec.
Surge current (I_{10^3}): 100A
Repetition (r): 10^3 times

Selection:

	K	I_{10^3}
5 Series	0.049	9.8A
7 Series	0.049	24.5A
10 Series	0.049	49.0A
14 Series	0.040	80.0A
20 Series	0.035	140.0A

Accordingly, 20 series is recommended.

Suggestions for Handling

1. In case of the line to ground use, attention should be paid for following points.
   A. When the insulation resistance test of the equipment employing the ZNR is conducted, the ZNR should be removed after getting approval from the customer so that leakage current of the ZNR generated by megatest voltage may not be confused with the insulation resistance deterioration of the equipment or the ZNR with the maximum allowable voltage exceeding the megatest voltage should be employed.
   B. When the withstanding voltage test is conducted, the ZNR should be removed or the ZNR with the maximum allowable voltage in excess of the test voltage should be employed.
   C. In a single phase, three-wire distribution system, an excessive load may be applied on the neutral wire when a wire is grounded. It is recommended, therefore, to employ following ZNRs in line to ground use.

Circuit Voltage (VAC)	Recommended ZNR Max. Allowable Volt. (VAC)
120	300
220	275
380	460

2. When the ZNR is used in high frequency circuits, heat generation must be avoided taking its electrostatic capacitance and dielectric loss angle into account.
3. A voltage exceeding the specified maximum allowable voltage should not be applied.
4. A surge in excess of the specified withstanding surge current may cause short circuits or mechanical breakdown. It is recommended, therefore, that a fuse listed below be put in series or the ZNR be used in a protective box.

   Recommended fuse

Withstanding surge current (A)	500	1,000	2,000	5,000	Over 10,000
Fuse (A)	3	5	10	20	Over 30

5. The ZNR should not be used near heat generating devices and be free from direct sunlight.
6. The ZNR should be free from dust, metal poder, rain, dew and sea wind. A protective box is recommended to prevent the unit from such.

Part Number Code